DECLARATION

I, Sigrid Sommerfeldt, of 1880 King Avenue, Boulder CO 80302-8044, declare that I am conversant with the German and English languages, and that, to the best of my knowledge and belief, the attached document is a faithful translation of the priority document, A1191/2002, filed in connection with United States Patent Application No. 10/523,825.

Dated this 19th day of July, 2010.

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filed a Patent Application regarding

"Method for the Production of Forgery-Proof Identification Features"

and that the attached description including drawings is identical to this original description including drawings submitted simultaneously with this Patent Application.

Application has been filed to name as inventors: Dr. Friedrich Kastner, Griekirchen (Upper Austria), Dr. Martin Bergsmann, Leonding (Upper Austria), Dr. Harald Walter, Schwabach (Germany), Dr. Georg Bauer, Fraham (Upper Austria) and Dr. Ralph Domnick, Lingen/Ems (Germany.

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Method for the production of forgery-proof identification features

The invention relates to a method for the production of forgery-proof identification features exhibiting a color shift effect due to metal clusters separated from a mirror layer by a defined transparent layer.

WO 02/18155 discloses a method for the forgery-proof marking of objects, wherein the object is provided with a marking comprised of an electromagnetic wave-reflecting first layer, onto which an inert layer, transparent to electromagnetic waves, of a defined thickness is applied, whereupon onto this inert layer a third layer follows formed of metal clusters.

The aim of the invention is to provide a method for the production of forgery-proof identification features on flexible materials, wherein the falsification security is given by a visible color change under several different observation angles (shift effect), which [security] is also to be machine-readable. In the machine-read spectrum the production method is to be uniquely encoded.

Subject matter of the invention is therefore a method for the production of forgery-proof identification features comprising in each instance at least one layer reflecting electromagnetic waves, a spacer layer and a layer formed of metal clusters, wherein onto a carrier substrate a partial or an overall electromagnetic wave-reflecting layer and subsequently one or several partial and/or overall polymeric layer(s) of defined thickness is(are) applied, whereupon onto the spacer layer a layer formed of metallic clusters is(are) applied, which metallic cluster layer is produced by means of a method employing vacuum technology or from solvent-based systems.

Carrier substrates to be considered are preferably flexible sheets of synthetic materials, for example of PI, PP, MOPP, PE, PPS, PEEK, PEK, PEI, PSU, PAEK, LCP, PEN, PBT, PET, PA, PC, COC, POM, ABS or PVC. The carrier sheets preferably have a thickness of 5-700 μm, preferably 8-200 μm, especially preferred a thickness of 12-50 μm.

As carrier substrates can further also serve metal sheets, for example Al, Cu, Sn, Ni, Fe or high-

grade steel sheets having a thickness of 5-200 μm, preferably 10-80 μm, especially preferred 20-50 μm. The sheets can also be surface-treated, coated or laminated, for example with synthetic materials, or they can be lacquered.

Further, as carrier substrates can also be utilized cellulose-free or cellulose-containing paper, thermally activatable paper or composites with paper, for example composites with synthetic materials with a grammage of 20-500 g/m^2, preferably 40-200 g/m^2.

Onto the carrier substrate is applied a layer reflecting electromagnetic waves. This layer can preferably be comprised of metals, such as for example aluminum, gold, chromium, silver, copper, tin, platinum, nickel and their alloys, for example nickel/chromium, copper/aluminum and the like.

The electromagnetic wave-reflecting layer can be applied over the entire surface or only partially using known methods, such as spraying, vapor deposition, sputtering, printing methods (gravure, flexographic, screen or digital printing), lacquer coating, roller coating methods and the like.

For partial application is especially suitable a method utilizing a soluble color application for the production of the partial metallization. In this method in a first step a color application soluble in a solvent is applied onto the carrier substrate, in a second step this layer is optionally treated by means of an inline plasma, corona or flame process, and, in a third step, a layer of the metal or metal alloy to be structured is applied, whereupon in a fourth step the color application is removed by means of a solvent, optionally combined with mechanical action.
The soluble color application can be carried out over the entire surface or only partially, the application of the metal or the metal alloy takes place over the entire surface or partially.

The color application can be carried out utilizing any method, for example by gravure, flexographic, screen or digital printing and the like. The coloring agent or lacquer utilized is soluble in a solvent, preferably in water, however a coloring agent soluble in any other solvent,

for example alcohol, esters and the like, can also be utilized. The coloring agent or the lacquer can be conventional compositions based on natural or synthetic macromolecules. Soluble coloring agents can also be pigmented or non-pigmented. As the pigment all known pigments can be utilized. Especially suitable are TiO_2, ZnS, kaolin and the like.

Subsequently, the imprinted carrier substrate is optionally treated by means of inline plasma (low pressure or atmospheric pressure plasma), corona or flame processes. Through a high-energy plasma, for example Ar or Ar/O_2 plasma, the surface is cleaned of tint residues of the printing coloring agents.

The surface is simultaneously activated. Terminal polar groups are herein generated on the surface. The adhesion of metals and the like on the surface is hereby improved.

Concurrently with the application of the plasma or corona or flame treatment or subsequent thereto, a thin metal or metal oxide layer can be applied, for example by sputtering or vapor deposition, as adhesion promoting agent. Especially suitable are here Cr, Al, Ag, Ti, Cu, TiO_2, Si oxides or chromium oxides. This adhesion promoting layer generally has a thickness of 0.1 nm to 5 nm, preferably 0.2 nm to 2 nm, especially preferred 0.2 nm to 1 nm.

The adhesion of the partial or overall electromagnetic wave reflecting metal or metal alloy layer is hereby further improved.

However, a partial layer reflecting electromagnetic waves can also be produced using a conventional known etching method.

The thickness of the electromagnetic wave-reflecting layer is preferably approximately 10-50 nm, however, greater or lesser layer thicknesses are also feasible.
If metal sheets are utilized as the carrier substrate, the carrier substrate itself can already form the electromagnetic wave-reflecting layer.

The reflection of this layer for electromagnetic waves, in particular as a function of the thickness of the layer or of the metal sheet utilized, is preferably 10-100%.

The polymeric spacer layer or the polymeric layers succeeding thereon can also be applied over the entire surface or only partially.
The polymeric layers are, for example, comprised of coloring or lacquer systems based on nitrocellulose, epoxy, polyester, colophonium, acrylate, alkyd, melamine, PVA, PVC, isocyanate or urethane systems.

This polymeric layer serves substantially as a transparent spacer layer, however, depending on the composition, can in a certain spectral range be absorbing. This absorbing property can optionally also be enhanced by adding a suitable chromophore. A suitable spectral range can be selected through the selection of different chromophores. Thereby, in addition to the shift effect, the polymeric layer can additionally also be made such that it is machine-readable. For example, in the blue spectral range (in the range of approximately 400 nm) a yellow AZO coloring agent, for example anilides, rodural or eosin, can also be utilized. The coloring agent moreover changes the spectrum of the marking in a characteristic manner.

As a function of the quality of adhesion on the carrier web or an optionally subjacent layer, this polymer layer can exhibit de-cross-linking effects leading to characteristic macroscopic lateral structuring.
This structuring can be specifically changed through modification of the surface energy of the layers, for example through plasma treatment, corona treatment, electron-, ion beam treatment or through laser modification.
It is further feasible to apply an adhesion promoting layer with locally different surface energy.

The polymeric layer has a defined thickness, preferably 10 nm to 3 μm, especially preferred 100 to 1000 nm. If several polymeric layers are applied, these can each have different thicknesses.

The polymeric layer can be applied using any desired coating method such as, for example, brushing on, lacquering, casting, spraying, printing (screen printing, gravure, flexographic or digital printing methods) or roller coating applications.

The polymeric layer is preferably applied using a method that permits application of highly homogeneous layer thicknesses over large areas. A homogeneous layer thickness is required in order to ensure a uniform color appearance in the finished product. The tolerances are preferably no greater than ± 5%, preferably ≤± 2%.

Especially suitable is herein a printing method, the coloring agent or the lacquer being applied from a temperature-controlled lacquer bath via an immersion cylinder and a transfer roller onto the printing cylinder, wherein substantially only the indentations of the printing cylinder are filled with the coloring agent or lacquer. By means of a coating blade, excess coloring agent or lacquer is wiped off and optionally further dried off by means of a blow bar.

Onto the polymeric layer subsequently a layer formed of metallic clusters is applied. The metallic clusters can be comprised of, for example, aluminum, gold, palladium, platinum, chromium, silver, copper, nickel and the like or their alloys, such as, for example, Au/Pd or Cr/Ni.
This cluster layer can be applied by sputtering (for example ion beam or magnetron) or vapor deposition (electron beam) out of a solution or through adsorption.

In the production of the cluster layer in vacuum processes the growth of the clusters, and therewith their form as well as the optical properties, can advantageously be affected by setting the surface energy or the roughness of the subjacent layer. This changes the spectra in characteristic manner. This can take place, for example, through thermal treatment in the coating process or by preheating the substrate.
For example, the form, and therewith also the optical properties, of the clusters can be affected by setting the surface energy or the condensation coefficient of the metal on the subjacent layer.

These parameters can be selectively changed, for example, by treating the surface with oxidizing fluids, for example with Na hypochlorite or in a PVD or CVD process.

The cluster layer can preferably be applied by means of sputtering. The properties of the layer, in particular density and structure, are set primarily through the energy density, the utilized gas quantity and its composition, the temperature of the substrate and the web [advance] rate.

If the application takes place from a solution by means of wet chemical methods, in a first step the clusters are produced in a solution, the clusters are subsequently derivatized, concentrated and applied directly onto the polymeric surface.

To apply the cluster layer using methods of printing technology, after the concentration of the clusters minimal quantities of an inert polymer are added, for example PVA, polymethyl methacrylate or nitrocellulose, polyester or urethane systems. The mixture can subsequently be applied onto the polymeric layer by means of a printing method, for example screen printing, flexographic or preferably gravure printing.

The thickness of the cluster layer is preferably 2-20 nm, especially preferred 3-10 nm.

Over the cluster layer a protective layer can additional be applied using methods of vacuum technology or printing technology.

In a preferred embodiment the polymer layer is specifically structured through modification of the surface energy.

Due to the color effect, the structures in this case appear highly rich in contrast through the subsequently applied cluster layer whereby they are readily detectable by the human eye. Through such a structuring an additional forgery-proof feature is therefore generated.

Through fingerprint algorithms this structuring can further be converted into unique codes which are subsequently machine-readable.
A structuring can thereby be assigned to a defined numerical value, wherein markings with like production parameters, e.g. with like color effect, become individualizable.

For utilization, especially as security feature, the discrete layer combinations can also be applied onto separate substrates.
For example, the electromagnetic wave-reflecting layer and the polymeric spacer layer can be applied on a first substrate, which, for example can be applied onto a document of value or be introduced into this document of value. Onto a further substrate the cluster layer can then be applied, which [layer] is optionally provided with an adhesive layer. By joining the two coated substrates, the characteristic color effect becomes subsequently visible according to the lock-and-key principle.

The carrier substrate can also already comprise one or several functional and/or decorative layers. As such coloring agent or lacquer layers diverse compositions each can be employed. The composition of the discrete layers can vary, in particular, as a function of their purpose, depending on whether or not the discrete layers serve exclusively for decorative purposes or are intended to be a functional layer or whether or not the layer is to be a decorative as well as also a functional layer.

The layers to be printed can be pigmented or non-pigmented. As pigments all known pigments, such as for example titanium dioxide, zinc sulfide, kaolin, ATO, FTO, ITO, aluminum, chromium and silicon oxides as well as also colored pigments can be utilized. Solvent-containing lacquer systems as well as also systems without solvents can herein be applied.

The functional layers can, for example, have certain electrical, magnetic, specific chemical, physical and also optical properties.

To set electrical properties, for example conductivity, can be added for example graphite, carbon black, conductive organic or inorganic polymers, metal pigments (for example copper, aluminum, silver, gold, iron, chromium, lead and the like), metal alloys such as copper-zinc or copper-aluminum or their sulfides or oxides, or also amorphous or crystalline ceramic pigments such as ITO and the like. Further, doped or non-doped semiconductors such as, for example, silicon, germanium or ion conductors, such as amorphous or crystalline metal oxides or metal sulfides, can also be utilized as additives. Further, for setting the electrical properties of the layer can be utilized or added polar or partially polar compounds, such as tensides or nonpolar compounds such as silicon additives or hygroscopic or non-hygroscopic salts.

To set the magnetic properties paramagnetic, diamagnetic and also ferromagnetic substances such as iron, nickel and cobalt or their compounds or salts (for example oxides or sulfides) can be utilized.

The optical properties of the layer can be affected by visible color substances or pigments, luminescent color substances or pigments, which fluoresce or phosphoresce in the visible, the UV or in the IR range, effect pigments, such as liquid crystals, pearlescent pigments, bronzes and/or heat-sensitive colors or pigments. These can be employed in all conceivable combinations. In addition, phosphorescent pigments alone or in combination with other color substances and/or pigments can be utilized.

Several different properties can also be combined by adding several different additives from the list above. For example, it is possible to use dyed and/or conductive magnetic pigments. All of the listed conductive additives can herein be employed.

Specifically for dying magnetic pigments all known soluble and insoluble color substances or pigments can be utilized. For example, through the addition of metals, a brown magnetic color can be adjusted to have a metallic, for example silvery, color tone.

For example, insulator layers can moreover be applied. Suitable insulators are, for example, organic substances and their derivatives and compounds, for example color substance and lacquer systems, for example epoxy, polyester, colophonium, acrylate, alkyd, melamine, PVA, PVC, isocyanate and urethane systems, which can be radiation-curing, for example by thermal or UV radiation.

These layers can be applied with known methods, for example by vapor deposition, sputtering, printing (for example gravure, flexographic, screen or digital printing and the like), spraying, electroplating, roller coating methods and the like. The thickness of the functional layer is 0.001 to 50 μm, preferably 0.1 to 20 μm.

Through single or multiple repetition of one or several described method steps, multilayer assemblies can be produced which exhibit different properties in the successively applied layers. It is herein feasible through the combination of different properties of the discrete layers, for example, layers having differing conductivity, magnetizability, optical properties, absorption behavior and the like, to produce assemblies, for example for security elements, with several precise authenticity features.

Each layer can already be present on the entire substrate surface or only partially or be applied over the entire surface or only partially.

The method steps can be repeated any number of times, wherein, for example in the case of overall application of a functional layer, the color application can optionally be omitted.

However, for example with known direct metallization methods or in metallization methods by etching, partial metal layers or, in known multicolor printing methods, further layers can, for example, also be applied.

The thus produced coated sheets can optionally be additionally protected through a protective

lacquer layer or, for example for further finishing or refining, be laminated or the like.

The product can optionally be provided with a sealing-capable adhesive agent, for example a hot or cold sealing adhesive applied onto the corresponding carrier material, or, for example in the paper production for security papers, be embedded into the paper through conventional methods.

These seal adhesives can be equipped with visible features or features visible under UV-light, fluorescing, phosphorescing, or with laser and IR radiation absorbing features to increase falsification security. These features can also be provided in the form of patterns or symbols or exhibit color effects, wherein in principle any number of colors, preferably 1 to 10 colors or color mixtures are feasible.

If coated on only one side, the carrier substrate can be removed after the application or remain on the product. The carrier sheet can herein optionally be especially equipped on the non-coated side, for example such that it is scratch resistant, antistatic and the like. The same applies to a possible lacquer layer on the carrier substrate.

The layer assembly can be set such that it is transferable or non-transferable, optionally with a transfer lacquer layer, which can optionally comprise a diffraction structure, for example a hologram structure.

The assembly according to the invention can also be applied inversely on the carrier material, wherein onto a carrier substrate one layer formed of metallic clusters, produced by means of methods using vacuum technology or from solvent-based systems, and subsequently one or several partial and/or overall polymeric layers of defined thickness are applied and thereon a partial or overall electromagnetic wave reflecting layer is applied.

Figures 1-6 depict examples of security features according to the invention.
Herein denote 1 a carrier substrate, 2 an electromagnetic wave-reflecting first layer, 3 a

transparent layer, 4 a metallic cluster-comprising layer, 5 an optically transparent substrate, and 6 an adhesive or lamination layer.

Fig. 1 shows a schematic cross section through a first always visible marking on a carrier substrate,

Fig. 2 a schematic cross section through a not-always visible first marking on a carrier substrate as well as a second carrier substrate suitable for evidence or for visualization,

Fig. 3 a schematic cross section through an always visible first laminatable or adhesible marking,

Fig. 4 a schematic cross section through a further always visible second laminatable or adhesible marking,

Fig. 5 a schematic cross section through a not-always visible first laminatable or adhesible marking as well as a second carrier substrate suitable for evidence or for visualization,

Fig. 6 a carrier substrate marked and continuously coated in large-scale processes to be forgery-proof, partially wound onto spools.

In the case of the markings depicted in Fig. 1 to 5, an electromagnetic wave reflecting first layer is denoted by (2). This can be a thin layer of, for example, aluminum. However, the first layer (2) can also be a layer formed of metallic clusters, which is applied on a carrier (1). The carrier (1) can be a carrier substrate to be marked. An inert spacer layer is denoted by (3). The metallic clusters (4) are advantageously produced of, for example, copper.
In Fig. 3 to 5 the adhesive or lamination layer provided for further processing of the forgery proof-marked carrier substrate is denoted by (6). The change of the reflected light generating the characteristic color spectrum in comparison to the incident light is illustrated in these two Figures by means of the gray scale in an arrow.

In the markings depicted in Fig. 1 and 3 a third layer (4) produced of metallic clusters is applied on the second layer (3). The second layer (3) is herein applied on a mirror layer (2). In Fig. 1 and 3, further, the mirror layer is applied on a carrier substrate (1).

In Fig. 4 onto a carrier substrate (1), firstly, the third layer (4) formed of metallic clusters is applied, subsequently the second layer (3), then the mirror layer (2) and, lastly, the adhesion or lamination layer (6).

In the case of the markings depicted in Fig. 2 and 5 only the optically transparent second layer (3) is applied on the electromagnetically reflecting first layer (2) and this [second] layer [is applied] on a carrier substrate (1). The marking is initially not visible. The markings are only visible when they are brought into contact with a substrate (5) on whose surface the third layer (4) formed of metallic clusters is applied. Subsequently, a color effect is, again, generated, which effect is observable through the substrate (5). The carrier substrate (5) is advantageously produced of a transparent material, for example of a synthetic material such as polyethylene terephtalate, polycarbonate, polyurethane, polyethylene, polypropylene, polyacrylate, polyvinyl chloride and polyepoxide.

The function of the marking is as follows:

Upon irradiation of light from a light source, such as a light bulb, a laser, a fluorescent tube, a halogen lamp, specifically a xenon lamp, onto one of the markings depicted in Fig. 1, 3, and 4, this light is reflected at the first layer (1). Through the interaction of the reflected light with the third layer (4) formed of the metallic clusters, a portion of the irradiated light is absorbed. The reflected light has a characteristic spectrum depending on several parameters, such as for example the optical constants of the layer assembly. The marking appears colored. The coloration serves as forgery-proof evidence of authenticity of the marking. The color impression obtained in this manner depends on the angle and can be identified with the naked eye as well as also with a reading device, preferably a spectrophotometer, operating in reflection mode. Such a photometer can acquire, for example, the coloration of the surfaces from two different angles. This takes place either by means of a detector thereby that two light sources are utilized, which are correspondingly connected and thereby the detector is tilted accordingly, or thereby that two photometers measure the sample, illuminated from two different angles, from these two

corresponding angles.

With respect to the parameters that must be maintained for the generation of the interactions, reference is made to US 5,611,998, WO 98/48275 as well as WO 99/47702 and WO 02/18155, whose disclosure content is herewith included.

The coated carrier materials produced according to the invention can be utilized as security features in data media, documents of value, labels, tabs or tags, seals, in packagings, textiles and the like.

Examples:

Example 1:

Production of the cluster layer using wet chemical methods:

a) Synthesis of 14 nm gold clusters:

In a 250 ml flask 100 ml distilled water are heated to boiling. While stirring vigorously, first 4 ml of 1% trisodium citrate in distilled water and subsequently 1 ml of 1% tetrachloro auric acid in distilled water are added. The color of the reaction batch changes from almost colorless to dark purple and then to cherry red within 5 minutes. The heat supply is subsequently discontinued and the batch is continually stirred for approximately 10 minutes. Analysis of the resulting sol under the transmission electron microscope shows spherical particles of a mean diameter of 14 nm. The size distribution of the clusters is narrow (CV < 20%). The wavelength maximum of the optical absorption is at 518 nm.

b) Derivatization of the gold clusters:

To 100 ml of the gold sol according to the above synthesis 1 ml of a 1% solution of BSA (bovine serum albumin) in distilled water is added while stirring the mixture vigorously. The solution changes slightly from cherry red to a darker red. The maximum of the optical absorption is retained. The absorption in the wavelength range of 550 nm and higher increases. Under the transmission electron microscope defined spaces between the particles can be observed.

c) Binding of the gold clusters to a surface of nitrocellulose:

The sol (nearly neutral pH, minimal salt) is rebuffered by adding 5 ml of a 1M sodium carbonate solution (pH 9.6). Only adequately protected clusters remain in solution and do not precipitate. The sol can be concentrated by centrifugation or, after application, binds directly to the surface coated with nitrocellulose. With suitable thickness of the nitrocellulose layer, strong surface colorations develop after the excess water is dried off.

Example 2:

Production of the cluster layer by means of methods using printing technology

After concentrating the sol by a factor of 10, minimal quantities (for example 5%) of a neutral polymer (for example PVA) are added. Hereby printing with conventional gravure printing cylinders is made possible. The colloids dry in random orientation with the polymer in a very thin layer. Characteristic colors as in Example 1c) are observed.

Example 3:

Production of the cluster layer by means of a method using vacuum technology

Under high-vacuum conditions (base pressure $p<1 \times 10^{-3}$ mbar) onto a web-form carrier substrate, already provided with a mirror layer and a nitrocellulose layer as a transparent spacer layer, is sputtered a Cu layer at a thickness of 4 nm.

The sputtering is carried out at 25 °C by means of a magnetron plasma source with a power of 20 W/cm^2 at a partial pressure of 5×10^{-3} mbar in an atmosphere of Ar as the process gas. The [advance] rate of the web is 0.5 m/sec.

Under these conditions the Cu layer exhibits pronounced island growth. The islands with a mean diameter of a few nm correspond to the clusters in the wet chemical method.

Other characteristic color spectra are clearly observed.

Patent Claims

1) Method for the production of forgery-proof identification features, each comprising at least one electromagnetic wave-reflecting layer, a spacer layer and a layer formed of metallic clusters, wherein onto a carrier substrate a partial or overall electromagnetic wave-reflecting layer and subsequently one or several partial and/or overall polymeric layers of defined thickness are applied, whereupon onto the spacer layer a layer is deposited formed of metallic clusters produced by means of a method using vacuum technology or from solvent-based systems.

2) Method for the production of forgery-proof identification features, each comprising at least one electromagnetic wave-reflecting layer, a spacer layer and a layer formed of metallic clusters, wherein onto a carrier substrate a layer is deposited formed of metallic clusters produced by means of a method using vacuum technology or from solvent-based systems and subsequently one or several partial and/or overall polymeric layers of defined thickness are applied, whereupon a partial or overall electromagnetic wave-reflecting layer is applied onto the spacer layer.

3) Method as claimed in one of claims 1 or 2, characterized in that onto a first carrier substrate an electromagnetic wave-reflecting layer and subsequently a polymeric spacer layer is applied and onto a second carrier substrate a cluster layer, wherein only by joining the two thus coated carrier substrates the forgery-proof identification feature is generated or can be demonstrated.

4) Method as claimed in one of claims 1 to 3, characterized in that onto the cluster layer a protective layer is applied.

5) Method as claimed in one of claims 1 to 4, characterized in that the layer onto which the spacer layer is applied is modified through treatment with oxidizing fluids or through a PVD or CVD process.

6) Method as claimed in one of claims 1 to 5, characterized in that the polymeric spacer layer is structured through de-cross-linking effects.

7) Method as claimed in claim 6, characterized in that the de-cross-linking structures of the structured polymeric spacer layer are transformed by means of fingerprint algorithms into unique codes.

8) Method as claimed in one of claims 1 to 7, characterized in that the polymeric spacer layer is modified through treatment with Na hypochlorite, through a PVD or CVD process.

9) Method as claimed in one of claims 1 to 8, characterized in that the polymeric spacer layer comprises a chromophore.

10) Method as claimed in one of claims 1 to 9, characterized in that the metallic cluster layer is deposited by sputtering or vapor deposition.

11) Method as claimed in one of claims 1 to 10, characterized in that the metallic cluster layer is deposited through magnetron electron beam or ion beam methods.

12) Method as claimed in one of claims 1 to 11, characterized in that the metallic cluster layer is deposited by means of a wet chemical method or by means of a method using printing technology.

13) Method as claimed in one of claims 1 to 12, characterized in that further functional and/or decorative layers are provided on the carrier substrate(s).

14) Method as claimed in one of claims 1 to 13, characterized in that the carrier substrate(s) is(are) provided with a hot sealing lacquer.

15) Security features produced according to a method claimed in claims 1 to 14.

16) Use of the security features according to claim 15 in data media, documents of value, packagings, labels, tabs or tags, or seals and the like.

Abstract

A method is described for the production of forgery-proof identification features as well as forgery-proof identification features produced according to this method, each comprising at least one electromagnetic wave-reflecting layer, a spacer layer and a layer formed of metallic clusters, wherein onto a carrier substrate a partial or overall electromagnetic wave-reflecting layer is applied and subsequently one or several partial and/or overall polymeric layers of defined thickness [is(are) applied], whereupon onto this spacer layer(s) a layer is applied formed of metallic clusters produced by means of a method using vacuum technology or from solvent-based systems.